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A CASE STUDY OF FACTORS AFFECTING
CONTINUOUS IMPROVEMENT
IN DOD ACTIVITIES
OPERATING UNDER TOTAL QUALITY MANAGEMENT

THESIS

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A CASE STUDY OF FACTORS AFFECTING CONTINUOUS IMPROVEMENT

IN DOD ACTIVITIES OPERATING UNDER TOTAL QUALITY MANAGEMENT

THESIS

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Master of Science in Logistics Management

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Preface

The intent of this research was to look at several
Department of Defense (DOD) organizations operating under
Total Quality Management to determine what factors
contributed to the success or failure of continuous
improvement initiatives within DOD. A need for this
research was established by an intensive review of the
literature, which revealed that little work, specific to
continuous improvement in the DOD, was available.

The skills developed in gathering the information
necessary to prepare this thesis represent an important part
of overall educational development. The process is one that
we will not soon forget.

This work would not have been possible without the
cooperation of the DOD organizations involved, the support
of our families, and the badgering of our advisors. We
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Table of Contents

List of Tables

AFIT/GLM/LA/93S-17

Abstract

This study looked at factors affecting the success or failure of continuous improvement initiatives in Department of Defense (DOD) activities to determine whether these activities were continuously improving and to identify factors affecting their efforts. Initially a list of relevant factors was compiled from the criteria for various quality awards and from factors cited in the literature. This list was synthesized into seven factors mentioned most often as critical to quality management and continuous improvement.

Interviews were then conducted with representatives of the three commands represented in the study. Each command provided information on a successful initiative and on an unsuccessful initiative. The interviews were reviewed and analyzed for information related to the seven critical factors, and then the relevant information was compiled into tables to facilitate comparison with these factors.

The research indicated that continuous improvement efforts involved many complex interrelationships, and required the presence of at least six of the seven factors for success. This research was intended as a foundation for future work.

A CASE STUDY OF FACTORS AFFECTING CONTINUOUS IMPROVEMENT IN DOD ACTIVITIES OPERATING UNDER TOTAL QUALITY MANAGEMENT

I. Introduction

Background

Department of Defense (DOD) directive 5000.51G defines Total Quality Management (TQM) as:

> Both a philosophy and a set of guiding principles that represent the foundation of a continuously improving organization. TQM is the application of quantitative methods and human resources to improve the material and services supplied to an organization, all the processes within an organization, and the degree to which the needs of the customer are met, now and in the future. (DOD 5000.51G, 1991:1)

The central theme of this definition is the continuous improvement of an organization's system of production and service through the application of quantitative methods. The dictionary definition of continuous is "Uninterrupted in time, sequence, substance or extent" (The American Heritage Dictionary, 1992:408). For the word improve the definition given is "To raise to a more desirable or more excellent quality or condition; make better; To increase the productivity or value of" (The American Heritage Dictionary, 1992:909). Phrases, such as, "never ending", "constant", "on going", "a way of life" and "forever" are used throughout the TQM literature, to describe the concept of continuous improvement (Deming, 1991: 23-24,40-41, DOD

1

5000.51G, Saylor 1990:20). Once the concept of continuous improvement is internalized in an organization, it is a process in which everyone in the organization, workers and managers alike, seeks opportunities for improvement (Imai 1986:5, McCarthy 1991:153). This concept of continuous improvement is an integral part of the TQM philosophy (Deming 1991:23-24).

The beginnings of the TQM philosophy can be traced back to the early sampling and statistical process control work of Harold Dodge, Harry Romig and Walter Shewhart at the Bell Telephone laboratories during the 1920s (McClave and Benson, 1991:705). Until recently, acceptance of management for quality using statistical techniques has been sporadic at best (Pinck, 1991:79-82). Statistical process control (SPC) methods focus on the monitoring of productive processes. Managers use charts and other statistical tools to ensure that predetermined performance standards are met.

SPC became popular in the United States during World War II. However, by the late 1940s, demand had so outstripped supply that quantity not quality became the general rule. In the post war era, the SPC methods developed by Romig, Shewhart, and Dodge, methods that had made America the Arsenal of Democracy, fell into disuse. W. Edwards Deming, a colleague of Shewhart and a pioneer in TQM, found a ready audience for his ideas with Japanese

businessmen and engineers trying to recover from the devastation of the war (Walton, 1986:11-15).

Deming and his techniques were enthusiastically accepted by the Japanese, and the resulting changes in the Japanese way of doing business are still reverberating through the world economy. Since the late 1970s TQM with its philosophy of continuous improvement has, out of necessity, been afforded a much wider acceptance in the United States. To remain competitive Xerox, 3M and Ford Motor Company adopted TQM as an integral part of their programs (Walton, 1986:22).

In 1986 President Ronald Reagan signed Executive Order 12522 directing designated federal agencies to achieve a twenty percent increase in productivity by 1992. In March 1988 Secretary of Defense, Frank Carlucci, directed organizations within the Department of Defense to began implementing TQM programs (Rumsey and Miller, 1990:3). The goal of these programs was to increase productivity, cut costs, and improve efficiency; in essence do more and do it better. Since that time, several DOD activities have received awards for their success in making TQM work. Many, if not all, activities have at least fledgling TQM programs.

TQM, like any new program, requires an investment of time and money in the implementation phase with the expectation of future benefits. This is especially evident in the realm of continuous improvement (Pinck 1992:82).

To maintain a successful TQM program, "management must accept the up-front cost and the prolonged gestation period before the new systems become alive and productive" (DOD 5000.51G).

Sudden breakthroughs or innovations produce large scale benefits; however, these are infrequent and can rarely be predicted. Imai, in his book Kaizen, makes the distinction between continuous improvement, or Kaizen, and innovation. He asserts that innovation is a "drastic improvement in the status quo as a result of a large investment in new technology and/or equipment" (Imai 1986:5-6). To the Japanese continuous improvement means "small improvements made in the status quo as a result of ongoing efforts" (Imai 1986:5-6).

Continuous Improvement (CI), as used throughout this study, is defined as incremental improvements made on a day-to-day basis. This does not necessarily imply small improvements. Increments may vary by orders of magnitude. However, it does imply an unrelenting program of ongoing improvements (Imai 1986:23-38, DOD 5000.51G:7).

General Issue

With the end of the Cold War and the resulting reductions in defense spending, managers are faced with tough decisions about how to allocate increasingly scarce resources. Are these resources to be expended on

continuously improving established processes, or on research, or on manpower, or on training or on any number of other deserving endeavors? The concept of continuous improvement, returning again and again to previously improved processes, seeking to improve them yet again, runs counter to the old philosophies of "good enough" and "if it isn't broke don't fix it". How much will, or should, management spend on continuously improving existing processes? Is continuous improvement within the realm of feasibility; can, or will, an organization improve constantly and forever, or is this a theoretical concept with no basis in reality? What causes an organization to seek to continuously improve?

Total Quality Management and continuous improvement efforts are often short-lived or become ineffective, particularly if not carefully monitored (DOD 5000.51G). However, numerous private and government organizations have successfully implemented TQM programs. Several have been recognized through the Malcolm Baldridge National Quality Award, the Presidential Award for Quality or the Quality Improvement Prototype Award.

Some organizations that have embraced TQM include: AiResearch, Norden Systems Inc., Xerox, Motorola, Federal Express and Harley-Davidson. AiResearch, once described as the worst defense contractor in the Los Angeles area, has made a commitment to continuous improvement. AiResearch

attributes its recovery to its commitment to CI/TQM.
Companies committed to TQM, like Norden Systems Inc., of
Norwalk, Connecticut, point to increased competition as the
reason for their commitment. Companies, such as Xerox,
Motorola, Federal Express and Harley-Davidson, have made TQM
work and are continuously seeking to improve.

Some companies backslide on their commitment to TQM.
This may result from a lack of commitment on the part of top
management, as was the case at Mason Trucking, or it may
involve other, less obvious factors (Lehman, 1991:50-54).
Florida Power & Light Company, a Deming Prize Winner,
experienced a change in leadership, ultimately resulting in
the elimination of most jobs related to TQM (Mathews,
1992:48-49). Another casualty, Wallace Co., a Houston,
Texas based oil-supply company and a Malcolm Baldridge
Winner, filed for Chapter 11 bankruptcy protection. A
flagging TQM program was one of the possible factors in
their demise (Mathews, 1992:48). Douglas Aircraft Company,
a subsidiary of McDonnell Douglas Corp., adopted TQM in
1989. In 1990, in the midst of a financial crisis, the
company eliminated 4000 jobs and ended TQM training (Mathews
1992:48-49).

Specific Problem

It is not known if DOD organizations are successful in
continuously improving, nor is it known what conditions lead

to continuous improvement. Examples from the private sector provide evidence that some organizations continue to improve, while others, even award winners, do not. Parallels may or may not exist between the experiences of private sector organizations and DOD activities.

Research Objective

The objective of this research was to determine whether or not DOD activities, operating under the Total Quality Management concept, were continuously improving; and to identify factors affecting their degree of commitment, or lack of commitment, to continuous improvement.

Research Questions

The following questions must be answered in order to achieve the research objective:

1. To what extent are DOD activities engaged in continuous improvement?

2. What factors are considered most important in influencing the degree of commitment, or lack of commitment, to continuous improvement in DOD activities?

Research Scope

The population of interest was limited to Department of Defense activities with successful TQM programs. The assumed measure of a successful TQM program was the winning of a Quality award, such as the Quality Improvement

Prototype Award (QIP) or the President's Award for Quality. The research focused only on those activities meeting this criterion. While many facets of TQM could be explored, this study was confined to investigating the extent to which the selected activities were engaged in continuous improvement, and what factors affected their degree of commitment, or lack of commitment, to continuous improvement.

Assumptions

First, this study assumed that winning a quality award is a measure of a successful TQM program. Second, it assumed that the activities selected for study had been operating under TQM long enough to be good sources of information concerning continuous improvement. Third, it assumed that the activities selected for study are the right ones to use in a study of this nature. It may be argued that a mix of successful and unsuccessful activities would provide better insights into the question of why some continuously improve and others do not.

Summary

Seeking constantly to improve is an idea that is very different from the way most American managers think. Short range focus and turning a quick profit have always been the rule. Fierce competition from foreign countries and an increasingly global economy have forced leaders and managers in the public sector, as well as the private sector, to re-

evaluate old ways of doing business. In the Department of Defense, budgetary constraints in a peace time environment have brought the mandate of increased productivity without increased funding (McCarthy and Eishennawy, 1991:153-157). Questions exist as to the effect of these and other factors on a manager's commitment to a program of continuous improvement. Questions also exist as to whether or not DOD activities are continuously improving their systems of production and service,

In the following chapters, this study attempts to gain insight into these questions and formulate answers. Chapter II presents a review of the available TQM literature. It provides a brief background of this management philosophy, including its development and previous research on the concept of continuous improvement. Chapter III discusses the methods used in the research effort with background and support for the particular methodology chosen. A summary of the information obtained from each participating activity is included in Chapter IV. Chapter V details the analysis of this information and presents conclusions drawn from the analysis. Recommendations for achieving continuous improvement and suggestions for future research are included in Chapter VI.

II. Literature Review

Introduction

Quality has long been the focal point of discussion among business managers. A quality "crisis" in Japan led senior managers to embrace statistical methods in an effort to improve the quality of Japanese products and to make those products competitive. For Japan, success in the world market place was vital to the country's economic survival. Dramatic improvements in the quality of Japanese products pushed U.S. industries to the brink of a similar quality crisis. More and more of their market share was being lost to the Japanese. Today, Total Quality Management (TQM) is being championed as the key to the survival of an America faced with the growing economic power of Japan and a united Europe (Walton, 1986:1-21).

Total Quality Management is a philosophy of continuous improvement of processes, goods and services. Complete customer satisfaction is its ultimate goal. Total Quality Management has the potential to transform any organization that applies TQM principles with dedication and purpose. Overcoming inertia and abandoning the short-term profit focus of traditional management styles for the quality focus of the TQM style of management is a major hurdle to implementation. The level of commitment to change will determine whether TQM will be internalized and

institutionalized in an organization; or be discontinued at some point, when the increase in profit is deemed insufficient to offset the cost of continuously improving (Prowse, 1990:4).

To form a frame of reference from which to evaluate commitment to TQM, and more specifically, to evaluate commitment to continuous improvement, some familiarity with the history of this revolutionary philosophy of management is necessary; as well as, at least a cursory understanding of basic TQM principles. Recent literature addressing various aspects of TQM is surveyed, and an attempt is made to draw some conclusions regarding the future of TQM, as it relates to the concept of continuous improvement.

The Conception of TQM

Japan. Prior to 1945 Japan's national policy favored military build up. The fact that Japan could produce high quality products was evidenced by the capability of Japanese weaponry to compete with any made in the world. At the same time products made for the civilian sector were of very low quality. Companies making goods for the private sector found it difficult to secure materials and financing. Japanese companies producing products for civilian markets had little knowledge of the quality standards of foreign markets. Thus, Japanese products failed to satisfy the

11

customer, and gained a reputation for low cost and low quality (Juran, 1991:73).

The ravages of World War II left Japan's industrial base in ruins. Their major cities were bombed out of existence, and their traditional markets in Manchuria and China were lost. The military, the major customer of Japanese industry, was no more. Confidence and morale were at an all time low. Japan was facing economic collapse. To survive the Japanese had to penetrate world markets. To do this, customer perceptions had to be changed from relating "made in Japan" with "junk", to equating "made in Japan" with quality (Walton, 1986:10-12).

In 1947 a group calling themselves the Union of Japanese Scientists and Engineers (JUSE) began meeting to formulate plans for the reconstruction of their country. Although there was much discussion, the group found they had no clear idea how to accomplish their goal. Americans from Bell Telephone Laboratories, working in Japan on loan to the Supreme Command for the Allied Powers (SCAP), became aware of the JUSE meetings. They determined that the Japanese group might benefit from studying Statistical Quality Control techniques, developed at Bell by Walter A. Shewhart.

Personnel from Bell provided JUSE with materials, including a book, written by Shewhart. Through these materials the Japanese became aware of the work of Dr. W. Edwards Deming, a colleague of Shewhart (Walton, 1986:11-

12). In March 1950 Deming was in Japan on assignment with SCAP. He was invited to speak to JUSE members and other Japanese researchers, engineers and plant managers on the subject of quality control methodologies (Walton, 1986:12).

In 1951 J. M. Juran published the first edition of the "Quality Control Handbook", which immediately became an important resource for the Japanese. Juran was also invited by JUSE to train managers and workers in quality control techniques. During Juran's first visit to Japan, which included tours of several companies, he was impressed by the way so many of the chairmen were personally taking charge of quality. Of his first lectures to the Japanese, Juran wrote, "Each was attended by 70 chairmen, presidents and directors, mainly from leading industrial companies. I had never before encountered so high a degree of participation by upper level managers" (Juran, 1991:73).

Among the course coordinators for Juran's lectures was Professor Kouru Ishikawa of Tokyo University. Ishikawa has remained a leading figure in the Total Quality movement through the present day. Utilizing the teachings of Deming and Juran, Ishikawa and others designed and conducted follow-on courses under the sponsorship of JUSE. The first in a long series of courses began in 1955. By the late 1950s thousands of Japanese managers and leaders had been trained in quality management methods (Juran, 1992:73).

During later visits to Japan, Juran noted that the use of statistical tools was being overemphasized, while the integration of managing for quality into the overall process of managing the business was being overlooked. Control rather than quality improvement was the central focus. This imbalance was also prevalent in the West at the time. Lectures given by Juran during this period stressed the need for continuing quality improvement (Juran, 1991:74).

By the early 1960s the imbalance between control and quality improvement in Japan had significantly decreased. Productivity was rising along with salaries. Intense activity in quality abounded, and a pervasive atmosphere of progress existed. Training in quality management was extensive. Courses were being offered over radio and television. Clearly Japan was making a large investment in time and money, paying the price for quality, and quality was beginning to get national attention. By the late 1960s evidence of the success of Japan's quality revolution was beginning to be seen in the rapid rise in exports, in the positive change in customer perceptions and in the impact of Japanese competition on U.S. markets (Juran, 1991:74).

At the 1961 European Quality Conference in Stockholm, Juran made this prediction: "The Japanese are headed for world quality leadership, and will attain it in the next two decades, because no one else is moving there at the same pace" (Juran, 1991:75). Japan's intense drive toward

quality continued into the 1990s, and Juran's prophecy proved correct.

The United States. In contrast to Japan, America's quality crisis did not begin until the late 1970s. It was brought on by increasing competition from Japan and other countries, by exploding oil prices and by emerging nationalism in the third world. For years after World War II, American businesses faced little or no competition and an almost insatiable demand for nearly every product that could be produced. It seemed management could do nothing wrong. Quality was not a leading management concern. By the 1970s Japanese products of superior quality and price were making serious inroads in traditional U.S. markets. American made products became synonymous with poor quality and high price; a situation not unlike that faced by Japan in the 1950s. Though not rebuilding from a devastating war, American business leaders began to see themselves in a similar survival situation.

On June 24, 1980 NBC broadcast a documentary entitled "If Japan can. . . Why Can't We?" The last fifteen minutes of this broadcast featured Dr. W. Edwards Deming highlighting his work at Nashua Corporation. Nashua, a manufacturer of carbonless carbon paper, had achieved savings of millions of dollars and increased productivity under Deming's tutelage. The day following the NBC

broadcast, Deming was bombarded with calls from American business leaders in trouble (Walton, 1986:19-20).

In October of 1980 the Growth Opportunity Alliance of Greater Lawrence (GOAL) contacted Deming. This coalition of labor and management had formed in an attempt to reverse the high unemployment and low productivity in and around the former Massachusetts textile town. GOAL began sponsoring breakfasts, where Deming spoke to Corporate Chief Executive Officers (CEOs) about his quality management principles. GOAL became the sponsor of the "Four Day Deming Seminars." Through these seminars top corporate leaders from companies, such as: AT&T, Campbell Soup, Digital Equipment Corporation, Duracell, General Electric, GTE, IBM Instruments, Proctor & Gamble Company, Union Carbide and Westinghouse became familiar with the principles of Total Quality Management and with Deming's Fourteen Points (Walton, 1986:158, 161-162). They also learned that there is no shortage of interpretations of the TQM philosophy.

What is Total Quality Management?

"TQM consists of the continuous process improvement activities of managers and workers in an integrated effort to improve performance at all levels" (Doherty, 1992:62). In this definition, the author leaves a good deal of latitude for individual interpretation. Emmelhainz, writing in the Air Force Journal of Logistics, reviews elements of

TQM, presented by several authors, and merges them into four
fundamental tenets of Total Quality Management: (1)
leadership, (2) complete customer focus, (3) continuous
process improvement, and (4) empowerment of employees. It
is his contention that these four tenets may be used to
define how TQM may be implemented in specific organizations
(Emmelhainz, 1991:35).

Total Quality Management is defined by the Department
of Defense (DOD) as:

> both a philosophy and a set of guiding principles that
> represent the foundation of a continuously improving
> organization. TQM is the application of quantitative
> methods and human resources to improve the material and
> service supplied to an organization, all the processes
> within an organization, and the degree to which the
> needs of the customer are met, now and in the future.
> (DOD 5000.51G, 1989:13)

The DOD definition focuses on:

- continuous improvement of processes

- motivation to improve from within

- the involvement of all functional areas within an
  organization

- the involvement and motivation of employees to drive
  improvement

- complete customer satisfaction

- goals or target values as steps in a continuous process

- use of modern technology for measurement and control

- education of managers and workers regarding the negative
  effects of variation.

A fourth definition, by Saylor, looks at TQM in terms of differences between it and traditional style management. Table 1 displays these comparisons.

TABLE 1

TRADITIONAL MANAGEMENT AND TQM COMPARISON

Traditional Management	Total Quality Management
Looks for "quick fix"	Adopts a new management philosophy
Fire fights	Uses structured, disciplined operating methodology
Operates in the same old way	Advocates "breakthrough" thinking using small innovations
Randomly adopts improvement efforts	"Sets the example" through management action
Focuses on the short term	Stresses long-term, continuous improvement
Inspects errors	Prevents errors
Throws resources at a task	Uses people to add value
Is motivated by profit	Focuses on the customer
Relies on programs	Is a way of life

(Saylor, 1990:20)

The Principles

Essential to the understanding of the impact of management commitment on the success of Total Quality Management initiatives is a familiarity with the principles which form the foundation of this management style.

18

W. Edwards Deming is recognized as the trailblazer of the TQM style of management (Traffic Management, July 1990:35). The heart and soul of TQM, as taught by Dr. Deming, are embodied in his fourteen points. They are listed below as they appear in Deming's book <u>Out of the Crisis</u>:

1. Create constancy of purpose toward improvement of Product and service, with the aim to become competitive and to stay in business, and to provide jobs.
2. Adopt the new philosophy.
3. Cease dependence on inspection to achieve quality.
4. End the practice of awarding business on the basis of price tag.
5. Improve constantly and forever the system of production and service, to improve quality and productivity, and thus decrease costs.
6. Institute training on the job.
7. Institute leadership.
8. Drive out fear, so that everyone may work effectively for the company.
9. Breakdown barriers between departments.
10. Eliminate slogans, exhortations, and targets for the work force asking for zero defects and new levels of productivity.
11. Eliminate management by objective and work standards.
12. Remove barriers that rob people of their right to pride of workmanship.
13. Institute a vigorous program of education and self-improvement.
14. Put everybody in the company to work to accomplish the transformation. (Deming, 1991:23, 24)

Deming's basic philosophy is that quality is improved as variability is decreased. He is an advocate of statistical process control, the on-line as opposed to the end-line method. Variation is eliminated during the process instead of during an inspection for defective items at the end of the process. Other quality gurus include Joseph M. Juran,

Philip B. Crosby and Genichi Taguchi (Traffic Management, July 1990:36).

Juran focuses on quality as fitness to serve. Quality means that a product meets a customer's needs and is free from defects. He emphasizes three managerial processes to achieve these ends: planning, control and improvement. In the planning phase a company must define its customer base and identify their needs. The control process involves measuring the difference between actual performance and performance goals, and then taking the necessary action to close any gap that exists. Continuous improvement is a call to management to make quality the basis for doing business. Juran believes in a systematic approach to quality that must be implemented on a company wide basis. He looks at quality as being the equal of financial considerations when measuring success (Traffic Management, 1990:37).

Crosby's focus is on doing the job right the first time. It is his contention that quality saves money. If management can eliminate the waste of time and resources associated with rework, they will more than recoup the funds spent on TQM implementation. Crosby's performance standard is zero defects. He believes this can be achieved by educating employees and restricting management interference (Traffic Management, 1990:38).

Taguchi believes that quality problems are rooted in design flaws. Poorly designed products that are defect free

are still subject to quality problems. Product quality is more a feature of sound design principles than of on-line controls. Taguchi criticizes management for looking at quality as an acceptable level of variation rather than as a specific target. He is an advocate of control charts that track process variation tied to a target level that minimizes total cost and quality loss. Near the target levels, production is continued without adjustment. Outside of specified limits, the process is stopped and adjusted (Traffic Management, 1990:39).

The principles put forth by each of these authors form a guideline for change that demands total commitment. Implementing these principles and achieving the increases in quality and productivity required for survival, mean hard work and a willingness to accept change. Senior management is responsible for and must be totally committed to this change if success is to be achieved (Prowse, 1990:4).

The Role of Management

Management, at the highest levels, must be totally committed to the organization's TQM program, and this total commitment must be demonstrated in an ongoing manner. If managers waiver in their commitment to the cultural change inherent in TQM, their programs are doomed (Prowse, 1990: 4).

The ideal person to oversee a quality program is the Chief Executive Officer (CEO). The CEO is ultimately responsible for the course of the organization. He or she oversees the development of the vision statement and strategic plan (Von Flue, 1990:15). Vision and strategic planning allow an organization to set priorities and to take action over time with specific goals in mind. This minimizes the effects of any temporary diversions (Zentmyer and Zimble, 1991:64). Additionally, the CEO insures the effective implementation of company objectives, policies, and procedures, and selects and molds subordinates in his or her own image (Von Flue, 1990:16).

In the event that the CEO is unable to assume direct control over TQM implementation, a senior manager, one with experience, unquestioned authority and flexibility, is required. If a person of too little stature is chosen, the ability to be effective across internal boundaries will be lost, and the program will fail (Kinni, 1992:36-37).

This high level vision and fervor must then be communicated through the ranks of middle and lower level managers to insure their continued commitment. TQM experts, such as Deming, Juran, Crosby and Taguchi may not always agree on definitions or methods, but they do see continuous improvement as the ultimate goal, and managers as the vehicle to achieve this goal. Jeffrey emphasizes this point when she states that "even though the success of quality

22

improvement can't be attributed to management alone, its failure almost always is" (Jeffrey, 1992:34-38).

The effects of a lack of top management involvement are demonstrated by the demise of the TQM program at Mason Trucking in 1989. In the initial stages of implementation, the company followed all the guidelines. Top management, middle managers and workers received quality training; the company mission statement was developed; a quality manager was hired and corrective action teams (CATs) were established. However, organizational changes and relationships were not addressed. CATs and middle managers came into conflict over implementation of recommendations. The quality manager had no authority to resolve these issues, and top management did not get involved (Lehman, 1990:7-10).

Financial problems that same year led to layoffs and to an overall downsizing of the company extending into 1990. With other things to worry about, management's benign neglect of the TQM program turned to blatant disregard. The corporate planning process, with its top down emphasis, became the primary vehicle for making improvements. The quality initiative was effectively dead (Lehman, 1990:7-10).

It cannot be emphasized enough that senior management commitment is the single most important factor in achieving total quality. A recent study of quality practices, conducted by Ernst & Young, showed American companies

lagging behind those in Germany and Japan in the level of
commitment to quality. The study reported that one fifth of
American companies do not regularly evaluate the
consequences of their company's quality performance compared
to only two percent of Japanese companies that do not. Only
29 percent of American businesses evaluate quality
performance more than once a year. In Japan 70 percent of
companies evaluate business performance as a function of
quality on a monthly basis (Bowles, 1992:42).

Only 20 percent of companies in the United States
regularly consider customer desires and expectations when
designing new products and services, as compared to 40
percent in Germany and 58 percent in Japan. Eighty-eight
percent of American companies do not use process
improvement. Japanese managers hold continuous process
improvement to be crucial to "customer loyalty" and to
satisfying the customer every time (Bowles, 1992:44).

American businesses continue to focus on the financial
statement as their first priority. Deming's point number
five, which states that improving the process and increasing
quality and productivity decreases costs, has not been
embraced by senior managers locked into the traditional
management mind set (Walton, 1986:33-39).

Another measure of management commitment is the manner
in which managers implement TQM principles. Managers are
tempted to pick and choose, and implement only those ideas

24

that support their own views (Emmelhainz, 1991:34). Jack

Van Acker, international president of the American

Production and Inventory Control Society, says:

> People have a tendency to choose one guru and become
> his or her disciple. What you need to do is listen to
> and read all four, and recognize that they are all
> saying the same thing, but in different ways. (Traffic
> Management, 1990:39)

Continuous Process Improvement (CPI)

Statistical process control through measurement is the

key to continuous process improvement, a subset of

continuous improvement. Ludemann notes that an important

tenet of CPI is: "Nothing improves until it is measured."

and the CPI corollary is, "As soon as something is measured,

it automatically begins to improve (Ludemann, 1991:81)."

The Defense Mapping Agency's (DMA) Plan for Continuous

Improvement states that there is no acceptable alternative

to continuous improvement. Even processes that are not

broken can be improved.

Emmelhainz suggests the use of "cycle time" and

"defects per unit" as appropriate measures to quantify

continuous improvement. These two parameters must be looked

at in tandem; otherwise, tradeoffs may do more harm than

good. To improve in one area at the expense of the other

would be to defeat the purpose (Emmelhainz, 1991:35).

Motorola, the winner of the Malcolm Baldridge National

Quality Award in 1988, has employees record defects found in

every function of the business. Their program to reduce total cycle time begins at product inception, and continues through the design, manufacturing and marketing phases (National Institute Award Winner, 1988).

Reducing variation in a process implies improving that process. A study at Packaging Corporation of America used a Pareto analysis to identify a variation in raw materials that was causing a nine percent reject rate and a five percent downtime for machinery. Process improvement, resulting from the study, reduced the reject rate to three percent and the downtime to two percent, a savings of millions of dollars with no additional outlays (Paton, 1990:33-41).

Savings, such as those realized at Packaging Corporation of America, are highly visible. As time passes the need for improvements may become less obvious and the results less spectacular. Managers will have a harder time justifying expenditures for continuous improvement. This is the time when organizations that have institutionalized TQM and continue to improve will stand out.

The Xerox policy of benchmarking the best organizations in the world in 240 key areas of service and performance, and then using these benchmarks as targets for their own performance is an example of institutionalization. Over the past five years, Xerox has cut defects by 78 percent, decreased unscheduled maintenance by 40 percent and cut

service response time by 27 percent. Their "Leadership Through Quality" program is now targeting 1993 for a 50 percent reduction in manufacturing costs and a four hundred percent improvement in reliability (National Institute Award Winner, 1989).

MCAS, Cherry Point, NC, a President's Quality Improvement Prototype award winner in 1991, has set a number of long-range goals for improvement. Among these are streamlining the procurement and personnel management processes, increasing off-the-shelf procurements, investing in new technology, improving management and increasing employee involvement. It is their ultimate goal to make continuous improvement a way of life at the depot. In working toward this goal, they act as a model of quality and productivity improvement for the DOD (Department of the Navy, 1988).

Roadblocks to Implementation

The traditional management viewpoint on business performance is a significant impediment to Total Quality Management. This is evident, not only in the private sector, but in the public sector as well. In 1989 a team of DOD and industry officials met to identify the problems affecting Total Quality Management implementation in DOD contracting and acquisitions. The team found that DOD policies emphasized low price by awarding contracts to the

lowest bidder, and emphasized schedules rather than quality in requests for proposals (RFPs). In addition, the team added that the DOD had not committed sufficient resources to implement TQM, and had failed to focus the media's attention on those quality improvements which were being made. The team concluded that, in the face of reduced defense budgets, implementation of TQM in industry and the DOD was vital to national defense (Doherty, 1992:62-66).

Based on an informal survey of recent literature, Kinni suggests five general categories of problems associated with TQM implementation. These are: short-term performance pressures; ineffectual leadership and incomplete support; poorly defined strategy and objectives; inappropriate program and performance evaluation; and lack of training (Kinni, 1992:35).

Short-term performance pressures, refer to the bottom-line mentality so common in American business. If there is not a quick, visible return on investments to show the shareholders, most companies are not interested. Lack of management support and ineffectual leadership can kill a TQM program quicker than any other problem. As mentioned earlier the unequivocal, highly visible support of all managers is absolutely essential for success. Poorly defined strategy and objectives relate to the organizations overall goals. If they are not clearly defined, questions arise regarding the route and the ultimate destination of

the organizations TQM program. In a well-managed program everyone knows where they are going and how to get there (Kinni, 1992:36-39).

Inappropriate programs and performance evaluation relates to the penchant for companies to design performance appraisals, and judge the success of programs by strict quantitative standards. This approach increases stress among employees and leads to production and morale problems. The final problem, addressed by Kinni, is the lack of training. For organizations to improve through the implementation of TQM, employees and managers need to receive training in the application of TQM principles, especially team concepts, and they need to upgrade the skills required for the performance of their jobs (Kinni, 1992:36-39).

In a study conducted by Rumsey and Miller in 1988, fifteen barriers to implementation of TQM within the Air Force Logistics Command (Table 2) were identified. The study was based on responses obtained from a cross section of AFLC employees attending TQM classes. These responses were categorized as "worker/management interface barriers" (1-4); "manpower and training barriers" (5-6); "philosophy, policy and procedural barriers" (7-11); and "low concern barriers" (12-15). Low concern barriers are those mentioned by less than three percent of respondents (Rumsey and Miller, 1990:4).

The concerns expressed by Kinni, Rumsey and Miller appear over and over in TQM literature. These are serious pitfalls on the road to quality improvement that must be addressed. Many TQM programs have been scrapped in the early stages through failure to confront problems as they materialize (Kinni, 1992:35-40).

TABLE 2

BARRIERS TO IMPLEMENTATION OF TQM

Rank	Barrier
1.	Lack of worker motivation
2.	Opposition of existing management
3.	Acceptance of status quo/ resistance to change
4.	Lack of effective communication
5.	Lack of adequate training and education
6.	Manpower concerns
7.	Incompatible management systems
8.	Production quotas
9.	All talk-no action
10.	Inadequate tools, equipment and supply systems
11.	Over-regulation
12.	Inadequate budgets
13.	Lack of pr ess controls
14.	Union resistance
15.	Awarding business on price alone

(Rumsey and Miller, 1990:4)

To Continuously Improve or Not Improve

Jerry Bowles, author of Beyond Quality, states "TQM is the minimum requirement for staying in the game" (Mathews

1992:49). Continuous improvement is the key to the very

survival of an organization (D'Angelo, 1991:19). According

to the DOD TQM implementation guide, continuous improvement

must be pursued forever (DOD 5000.51G:43). As previously

seen in Chapter I, some organizations, which have been

lauded for their success in quality improvement, continue to

improve, while others do not.

One organization with a strong commitment to TQM is

Norden Systems Inc., of Norwalk, Connecticut. Reasons cited

for such strong commitment are: increased competition,

extended customer requirements, inflated production costs

and expanded development of new manufacturing and

information processing technology. For Norden, improvement

means the company can: bid more competitively, win new

business, control assets more effectively and reduce

inventory and cycle time (D'Angelo, 1991:18-19).

AiResearch Corp., once described as the worst defense

contractor in the Los Angeles area, has made a commitment to

continuous improvement. "To compete and grow in an

increasingly competitive industry, we have been cultivating

a culture of continuous improvement throughout the

organization..." (Shah, 1991:18-19). AiResearch attributes

its recovery to its commitment to CI through TQM. Before

implementation of TQM the company had delinquency rates of

40 percent. As a result of its commitment, the company now

boasts improvements which include: a 10 percent reduction in

the delinquency rate, an increase in profit/cash flow, an 80 percent drop in rejections, a 42 percent reduction in inventory and a strong increase in valuable customer satisfaction. AiResearch is now rated as one of the best contractors in the Los Angeles area (Shah, 1991:18-19).

Many organizations, such as the ones just cited, continue to improve while others backslide. Two examples of backsliding are Florida Power & Light Company, a Deming Prize Winner, and Douglas Aircraft, a subsidiary of McDonnell Douglas Corp.

Florida Power & Light's new CEO eliminated most jobs related to TQM. He stepped in and "slashed the program because of worker complaints of excessive paperwork." The company's TQM program also produced a significant number of recommendations from lower level employees. This bottom-up flow was in opposition to the new CEO's top-down management style (Mathews, 1992:48-49).

Douglas Aircraft adopted TQM, sending 8000 to Total Quality seminars, in 1989. In less than two years time, their TQM program was in serious jeopardy. In 1990 the company eliminated 4000 jobs and ended TQM training, leaving employees "wondering if company management cared about their suggestions" (Mathews, 1992:48-49).

Both failures, noted above, stem from the private sector. It is not known whether any TQM efforts within the DOD have similar histories, nor is it clear what conditions

cause an organization to continuously improve or not to continuously improve. The examples above suggest some contributing factors such as increasing competition, rising costs, declining profits, weakening management commitment and stiffening customer requirements, all of which may impact, separately or in combination, whether or not an organization continuously improves.

Beyond Implementation

To this point concerns associated with implementation of a TQM program have been reviewed. The question now is, what happens over the long run, after the program has been successfully established? As mentioned above, some organizations, with programs that were considered successful, have moved away from managing for total quality. There is no doubt that there are many factors, internal and external to the organization, which influence its commitment to TQM. It is also reasonable to assume that no one factor determines whether an organization will continuously improve or not.

Successful organizations are constantly on the lookout for opportunities to improve (McCarthy, 1991:153). Each of the proponents of TQM have their own ideas concerning the factor or factors that are critical to the success of an organization's TQM/CI effort. Most of this wisdom is directed toward those about to, or that have only recently,

launched their TQM program. Building on previous work, an attempt has been made to distinguish elements crucial to the long-term success of an organization's campaign of continuous improvement.

External Factors

The current world political and economic environment directly influences every decision an organization makes. Economic hard times have caused some private sector companies to abandon TQM in search of another, perhaps quicker, solution to their declining economic situation (Mathews, 1992:48-49). Factors, cited throughout the literature, which impact the organizations position on TQM and continuous improvement include: survival, increased competition, tougher customer requirements, increasing costs of production, budget cuts, and downsizing (D'Angelo, 1991: 18-19).

Internal Factors

In their 1989 article, "An Instrument for Measuring the Critical Factors of Quality Management", Saraph and others presented a synthesis of the quality literature available at that time. Included in their review were the writings of: Deming; Juran; Crosby; Ishikawa; Feigenbaum; Garvin; Mondon; Leonard and Sasser; Adam, Herschauer and Ruch; and eleven others. From this comprehensive review, Saraph and others identified eight factors critical to quality management.

Saraph and others concluded that these factors, presented in Table 3, are the critical factors necessary to achieve quality management.

Steel and Jennings, writing in <u>Research in Organizational Change and Development</u>, presented a similar study of factors critical to quality management. These factors were contrasted with the work of Saraph and others in Table 3 (Saraph, et. al., 1989:810-818; Steel and Jennings, 1992).

Complementing these are the factors identified in the award criteria for the Malcolm Baldridge Award, the Deming Prize, the Presidential Award for Quality, and the Quality Improvement Prototype (QIP) Award. The award factors, also in tabular form to facilitate comparison, are presented in Table 4 (National Institute Malcolm Baldridge Award, 1993; Chase and Aquilano, 1992:229; Federal Quality Institute, 1992).

TABLE 3

AUTHOR CITED FACTORS AFFECTING CONTINUOUS IMPROVEMENT

Saraph and Others	Steel and Jennings
Role of management, leadership and quality policy	Top management commitment
Product and service design	Quality engineering
Supplier quality management	Supplier relations management
Employee relations	Employee empowerment
Role of the quality department	Quality policy development
Process management	Continuous process improvement
Training	Problem solving training
Quality data and reporting	Measurement bias
	Changing corporate culture
	Cross-functional problem solving
	Customer relations management

TABLE 4

AWARD CITED FACTORS AFFECTING CONTINUOUS IMPROVEMENT

Malcolm Baldridge	Deming Award	Presidential Award	Quality Improvement Prototype Award
Leadership	Policy and objectives	Top management leadership and support	Top management leadership and support
	Organization and operation		
Management of process quality		Quality assurance	Quality assurance
	Education and extension	Training and recognition	Training and recognition
	Standardization		
	Control		
Information and analysis	Data gathering reporting analysis	Measurement and analysis	Measurement and analysis
Human resource development and management		Employee empowerment & teamwork	Employee empowerment & teamwork
Strategic quality planning	Future plans	Strategic quality planning	Strategic quality planning
Customer focus and satisfaction		Customer focus	Customer focus
Quality and operational results	Effects	Quality and productivity improvement results	Quality and productivity improvement results

Seven factors appear most frequently (appearing in at least five of the six sources above) as critical to quality management and continuous improvement. They are:

- top management leadership and support
- the role of the Quality Assurance Department
- training and recognition
- measurement and analysis
- employee empowerment and teamwork
- strategic quality planning
- quality and productivity improvement results.

These seven factors formed a pattern against which to compare an empirically based pattern. This pattern, or core set of factors, was the starting point for this research effort and the basis for the investigation of what factors might actually be the most influential in achieving continuous improvement.

The Future of TQM

In some organizations, where TQM principles are being implemented and utilized, management is worried that a problem exists with the program. TQM has not produced, at the rates previously achieved, profit increases in proportion to the time and effort invested. Workers report that managers are not acting on their suggestions as enthusiastically as before, and that management support for the program may be declining. This has lead to speculation

that TQM may go the way of Quality of Work Life programs (Danjin, 1992:94), Management by Objectives and Quality Circles. This skepticism is, however, premature.

Some of America's largest corporations are learning the lesson that commitment to quality is the key to a successful business enterprise. Focusing on quality, IBM involved the customer in the development of its new AS/400 computer system from the first design stages. This ultimately resulted in a quality product and one of the most successful new product introductions in IBM history. The Malcolm Baldridge Award for Quality was awarded to IBM for this program. Now other American companies have intensified their quality efforts (Bowles, 1992:45).

Results of the Ernst & Young/American Quality Foundation International Study showed that the United States plans to dramatically increase the use of technology to meet customer expectations over the next three years. "The percentage of U.S. businesses that use quality as a primary criteria for senior management compensation is expected to rise from the current 19 percent to 51 percent over the next three years" (Bowles, 1992:46). These facts indicate that quality is becoming an important facet of American business philosophy.

Conclusion

The focus on quality which spawned the Total Quality Management revolution was born out of a survival crisis, first in Japan then in the United States. Japan's commitment to quality as a means of penetrating world markets and gaining customer confidence caused a crisis in America. Japanese products of high quality and low price eroded the market share of American businesses. The power of the TQM philosophy was demonstrated, convincingly, to the world.

For any business organization, survival in the increasingly competitive world market place means continuously improving the quality of goods and services. The company that fails to do so will not remain in business long. In an increasingly competitive world, customer satisfaction is the ultimate goal, and TQM is the means for achieving the quality improvements necessary to reach that goal.

TQM is a revolution in management thought, requiring the strong commitment of senior managers to be successful. If its principles are applied with dedication, TQM has potential to change every facet of an organization. It is management's responsibility to initiate these changes, to break from the traditional management focus on short-term profit and to focus on continuously improving quality.

40

Commitment is the essential ingredient in making the change to the Total Quality style of management. More and more businesses are making the connection between quality and profitability. Yet, current levels of commitment are below what is required to make managing for quality an integral part of the way managers do business. Plans for putting into action or accelerating the use of quality related practices and strategies are being made by many American businesses (Bowles, 1992:46). The next few years are crucial in determining whether TQM will become internalized and institutionalized, or become just one more failed management initiative.

This review has looked briefly at the major tenets of TQM. Although TQM has received considerable attention over the past few years, opportunities to break new ground or to conduct follow-on studies exist in each of these areas. Research needs to be done to determine what courses of action will help America establish a reputation for world class quality. Chapter III goes on to explain the methodology used in the present research.

III. Methodology

Introduction

The objective of this research was to determine whether
or not DOD activities, operating under the Total Quality
Management concept, were continuously improving; and to
identify factors affecting their degree of commitment, or
lack of commitment, to continuous improvement. In order to
achieve this objective, an appropriate research design and a
method of analyzing the collected information were required.

This chapter details the research design employed and
the method used to gather the evidence to answer the
research questions posed in Chapter I. The characteristics
of the relevant population, the units of analysis and the
methods used to collect and analyze the evidence are
discussed.

Research Design

Much has been written about the factors that impact the
successful implementation of TQM in an organization. Little
research, however, has been conducted into what influences
an organization to make continuous improvement a way of
life. There is also a lack of research regarding the key
factors or conditions that must be present to ensure that a
continuous improvement program does not lose momentum.

The case study research design was chosen as best
suited for this effort. The case study approach has often

been useful, as a first step, in researching an unresearched area or concept (Leenders and Erskine, 1989:2). The case study places "more emphasis on a full contextual analysis of a limited number of events and their relationships" (Emory and Cooper, 1991:142). Contextual analysis of the factors influencing continuous improvement should provide the insight to achieve the research objective.

Units of Analysis

A unit of analysis may be defined as a person or group of persons, an event or an entity (Yin, 1989:31). In this research the primary units of analysis were DOD activities operating under the tenets of TQM. The use of more than one activity, or unit of analysis, made this a multiple-case study (Yin, 1989:31). Each activity was handled as a case independent from each of the others during the evidence collection stage and initial analysis.

Population

Hundreds of activities within the Department of Defense began operating under the TQM concept after the 1988 directive. DOD activities having well-established, successful Total Quality Management programs constituted the population for the research. Activities with successful programs were considered to be those that had previously won a quality award, including the Quality Improvement Prototype (QIP) Award and the Presidential Award for Quality. Since

43

1988 ten activities within the DOD have won these awards. Each activity was considered a potential candidate for the study.

Based on this criterion, activities were chosen to represent the larger population. To ensure a sufficient period of time over which to evaluate an activity's continuous improvement effort, those activities which had received the earliest awards were selected for study. Activities selected were the Naval Aviation Depot, Cherry Point, NC, the 1988 QIP Award winner; the Naval Shipyard, Norfolk, VA, winner of the 1989 QIP Award; and the 653rd Communications-Computer Systems Group (formerly the 1926th Communications-Computer Systems Group), winner of the 1991 QIP Award.

Interviews

Personal and telephone interviews were chosen as the method of collecting information. Regarding interviews, Emory and Cooper state that, "The greatest value lies in the depth and detail of information that can be secured" (Emory and Cooper, 1991:320). The interview method has the advantage of allowing the interviewer to improve the quality of the information gathered by clarifying questions for the respondent. Probing for additional information, by asking follow-on questions and by allowing for consideration of the conditions of the interview, is facilitated as well.

"Interviewers also have more control" and "can make adjustments to the language of the interview, because they can observe the problems and effects that the interview is having on the respondent" (Emory and Cooper, 1991:320).

Points of contact were obtained from a listing provided by the Federal Quality Institute and initial telephone introductions were made. During subsequent calls to each activity, schedules for on-site and phone interviews were agreed upon. Interviews were scheduled with the Commanding Officer of each activity or his designated representative. The interviews were taped for later transcription.

Letters of introduction were sent to the interviewees. The purpose of the research was explained and the initial interview questions were provided. In order to lay the foundation for the interviews, respondents were asked to identify one instance where continuous improvement had been achieved, and one instance in which problems had been encountered and continuous improvement had not been achieved.

With these activity specific examples as a frame of reference, each interviewee was asked the following initial questions:

- What was it that enabled the activity to achieve continuous improvement?

- In the unsuccessful example, what was it that kept the activity from achieving continuous improvement?

45

- What were the similarities in the successful and the unsuccessful initiatives?

- What were the differences between the successful and the unsuccessful initiatives?

- In the instance where continuous improvement was not achieved, what was done to fix the problem?

These unstructured questions afforded the respondents a good deal of latitude in their answers.

A set of follow-on questions was then prepared to provide a non-biased method of probing into specific areas of interest. These questions were based on the seven factors identified in Chapter II as critical to continuous improvement. These follow-on questions were subsequently consolidated into a general interview guide contained in the Appendix. This guide was used to insure that supplemental questions were worded the same for each interview, and to aid in the conduct of the interviews.

Prior to finalizing, the interview questions were reviewed by two academic advisors, and a pretest was conducted. This pretest took the form of a trial interview conducted with the Air Force Material Command, Assistant to the Commander for Quality. The pretest helped to clarify the questions, improve continuity and flow, determine sequencing and insure completeness.

Each activity was also asked to provide charts, graphs or other material documenting continuous improvement within

their activity. Information derived from these supplementary materials increased the validity of inferences made in the analysis.

Analysis

As a first step in the analysis, the magnitude and periodicity of improvements within each activity were studied. An evaluation, based on documentation obtained in each case study, was made regarding the extent of engagement in continuous improvement. The evaluation was conducted using a method of analysis identified by Yin in <u>Case Study Research: Design and Methods.</u>

Case study analysis normally takes one of three dominant forms: pattern matching, explanation building or time series analysis. Unless special circumstances are involved, such as a study containing embedded units of analysis, single or multiple case designs may be studied using one of these techniques. This particular analysis required the use of pattern matching, the comparison of an empirically based pattern with a predicted one. The presence of a pattern strengthens the internal validity of the case (Yin, 1988:105-107).

The seven factors identified in Chapter II and listed below formed the predicted pattern of interest:

- top management leadership and support
- the role of the quality assurance department

- training and recognition

- measurement and analysis

- employee empowerment and teamwork

- strategic quality planning

- quality and productivity improvement results

These factors were expected to be crucial to an activity's achievement of continuous improvement. In instances where continuous improvement was not achieved, some or all of these factors were expected to be missing.

The interview transcripts were thoroughly reviewed for information regarding the positive or negative influence of the seven factors and then summarized. The summaries are presented in Chapter IV.

Subsequently, a comparison of the information collected from the three facilities was made. This step was intended to determine the presence or absence of themes linking the seven critical factors with the presence or absence of continuous improvement. The results of the analysis are discussed in detail in Chapter V.

IV. Interview Summaries and Comparisons

Introduction

This section presents a synopsis of the responses obtained through interviews conducted with each of the representatives of the three participating organizations. Each organization was handled as a separate case. Each case was reviewed individually with the focus on the responses given to the initial and supplemental questions included in the Appendix. Each case synopsis consisted of an initiative where continuous improvement was achieved, an initiative where continuous improvement was not achieved and a comparison of the two initiatives.

Case One

In this case the activity's overall quality program coordinator was interviewed. Two examples of improvement initiatives were discussed; one initiative concerned the overhaul of a major end item, and the other initiative concerned the application of statistical process control (SPC) to various types of industrial work processes. Chronologically, the example given in which continuous improvement was not achieved, the SPC initiative, occurred first. This was approximately a year after the organization began implementing TQM. The successful example, the overhaul initiative, occurred approximately a year after the organization won the QIP award in 1988.

49

Continuous Improvement Achieved: The Overhaul Initiative. This example involved a problem which existed, without resolution, for the majority of the end items operating life. Prior to the process improvement initiative, each end item required 22 separate adjustment and test cycles to bring it into conformance with specifications. Each adjustment took approximately four hours to perform exclusive of testing.

Employee involvement and the application of measurement tools were cited as the two main factors leading to the achievement of continuous improvement in this initiative. Employee involvement was central to analyzing the process and recommending corrective action. Statistical methods were used to track and measure the process. Shop level employees were empo ered to do anything they could to improve the processes within the shops. Recommendations involving tasks outside their ability to perform, such as rearranging the shop floor or changing the process flow, were acted upon.

The Quality Assurance Department did not adjust to the new way of operating and was disbanded. Quality Assurance personnel were subsequently dispersed to other departments. Top management integrated the quality effort into each person's job, making everyone responsible for quality.

After analyzing the problem and applying statistical process control methods, a solution was formulated and

implemented. As a result the number of adjustment and test cycles per end item was reduced to one. Adjustment time was reduced to 30 minutes. Approximately $2,000,000 in end item maintenance cost savings were achieved as a result of this initiative.

Continuous Improvement Not Achieved: The SPC Initiative. In this example ten areas were selected by top management for improvement through the application of statistical process control. The processes involved were plagued by extremely high reject rates.

The underlying problem with this initiative was the failure to train middle managers in SPC. These mid-level managers received broad based training in total quality, but they were not afforded detailed training in SPC or apprised of its benefits. A group of shop employees were trained in SPC methodology, and these workers developed an appreciation for the potential benefits available through the application of SPC to their processes. The initiative failed because the mid-level supervisors and managers were not included in the process by upper management.

Control charts, showing reject rates, were made and posted by shop employees. Managers and supervisors, accustomed to criticism over high reject rates, removed the charts. Furthermore, managers and supervisors berated shop employees and prohibited them from displaying their charts.

The involvement of the Quality Assurance (QA) Department in this initiative was cited as minimal. The QA Department was seen as functioning in an adversarial role, at that time. Senior management in the QA Department was supportive of Total Quality. They attempted to influence their people toward becoming facilitators and toward becoming more process oriented. QA personnel, however, continued to inspect and police. This occurred despite the fact that they had more detailed Total Quality training than any other group of employees. The QA Department was eventually disbanded.

Steps were taken to salvage this initiative. The effort was halted completely, and managers at the division, branch, and shop level were systematically trained and made knowledgeable regarding the objectives of, and the benefits to be derived from, the initiative. After educating the managers, facilitators were again assigned to help shop personnel. The effort was then restarted with increased support from the managers.

Compare and Contrast. In both examples top management was characterized as very supportive, because they could see the return on the investment of resources. However, communications from the top down to the shop floor employees was noted as not being very good despite a concerted effort to improve communications.

Recognition was considered to have had little influence on the success or lack of success of the initiatives in this case. The current command recognition program is focused on teams and team efforts. Individual performance awards are not given. The present award system is centered on productivity gain sharing.

Strategic planning for quality was viewed as extremely important, especially in the early stages of implementation of TQM within the activity. The strategic plan provided a focused agenda for top management. It contained long-range strategic goals (3-7 years), operational/tactical objectives and strategies (1-5 years), and plans of action and milestones (this year) to achieve stated objectives and goals. The TQM office functioned as facilitator for the yearly plan. The plan is updated quarterly, and monthly reports are used to track and measure progress toward goals and objectives set forth in the strategic plan.

The two initiatives were similar in that both involved processes with high reject rates, stemming from quality problems. In both an attempt was made to apply statistical methods to measure and to analyze the process.

In the example where continuous improvement was not achieved, the SPC initiative, a group of selected individuals, considered to be supportive of Total Quality, were provided training and help in the initial stages of the improvement effort. The approach in the Overhaul initiative

was to involve everyone, allowing each person with a part in the subject process to have input and opportunity to identify what the major problems were. Everyone was made a part of the effort to improve the process.

Case Two

The representative in this case was a Program Analyst, who worked with counterparts from similar activities, with activity management, with operational department heads and with the Quality Department to deploy TQM. Again, two initiatives were discussed; one initiative involved an industrial laboratory setting, and the second initiative concerned a pass office. Chronologically, the successful initiative began first, and it was followed within a year by the unsuccessful initiative. At the time of the interview, both initiatives were ongoing.

Continuous Improvement Achieved: The Lab Initiative. The successful initiative involved an industrial laboratory situation. The job requirements entailed analyzing industrial samples for foreign material. There were a number of procedures in the process that slowed it down and hindered communications among the various lab branches. Lab personnel formed a Process Action Team (PAT) to perform a detailed analysis of the problem. The PAT selected: sample flow, feedback, and lack of understanding of each other's capabilities as problem areas to work on.

The PAT team's impact statement identified two areas of concern. Problems with foreign material sample flow within the lab were contributing to analytical delays, and there was a lack of feedback leading to a lack of understanding of current branch capabilities. Foreign material identification was urgent in many instances, and the desired situation was one in which analysis was thorough and rapid, minimizing production work stoppages.

The foreign materials analysis PAT team fostered a climate where teamwork flourished, and cross-branch cooperation and conformation of results became commonplace. As a result, the process continued to improve, despite a significant increase in workload and the loss of personnel. More work was handled with greater reliability. Correct identification of samples increased from 54 percent to 80 percent during the initial effort.

The supervisor, trained in Total Quality, realized the potential of the TQM program. Under her leadership other people began to realize how valuable TQM actually was. At first there was the normal reluctance to change, but as efficiency improved aɪ ɔhe job became easier, more people became converts. The lab supervisor was credited with this particular success, having taken a great deal of time to bring people together.

Continuous Improvement Not Achieved: The Pass Office Initiative. The second example offered, an initiative in

which improvement was achieved but was not sustained, centered on the pass office, a part of the activity's industrial security apparatus. Gaining access to the facility was a complex and confusing process. The process became so complicated that the activity's Commanding Officer received numerous complaints from people, on legitimate business, who could not expeditiously gain access to the facility.

A PAT was chartered to investigate the problem. One person from the management engineering office, several security people and a number of others formed the PAT. The PAT analyzed the problem and made a number of substantial changes, greatly simplifying the way the pass office operated. While not compromising security, the process was made considerably simpler and more user friendly.

Personnel that worked with the PAT team came to understand the value of customer focus and importance of service to the customer. However, when a nearly complete turnover in pass office personnel occurred over a period of less than a year, no method was in place to institutionalize the improvements that had been achieved. When the new people came in, their view of customer focus was either not as developed, or entirely different from that of the previous group. In the case of this failure, there was no universal understanding of the precepts of TQM. Marked improvements were made in the process, but the failure to

make the improvements a part of the culture led to an eventual decline to previous service levels.

The lack of continuous improvement in this initiative was ascribed to a lack of leadership on the part of management. When cultural change was introduced, it required a tremendous amount of leadership to institutionalize the new culture. This leadership was not forthcoming; therefore, new arrivals to the section were not assimilated into the culture. Too much reliance was placed on a few customer focused individuals to carry on the process. When these people transferred, the improvements achieved were lost. Their understanding of TQM and customer focus, as it related to the process, went with them instead of being passed to the next generation of pass office personnel.

Compare and Contrast. In each instance a contractor provided initial TQM training. A variation of the Walter Shewhart plan, do, check, act cycle (PDCA), was taught. This variation was referred to as the FADE process: focus, analyze, develop a conclusion and execute. This cycle is designed to be iterative in nature, looking at the subject process over and over again for opportunities to improve.

In the laboratory example, the FADE process was used very successfully. In the pass office example, the process was successful initially. Vast improvements in the process were obtained, but lost over time when the FADE process was

not continued. The failure to maintain the FADE process was due to a lack of leadership, training and universal understanding of the precepts of TQM.

The root cause of the problem in the pass office was the failure to make the change a part of the culture. The pass office did well initially. The people working in the office accepted their role as representatives of the facility; however, this attitude was not institutionalized. When a significant turnover in people occurred, the organization quickly reverted back to the old culture. The people in the lab, because they had strong leadership, were able to maintain their momentum and to successfully institutionalize the change. They continued to re-evaluate and bring about incremental improvements.

Training was the foundation for both programs. People did not do things readily unless they understood them and perceived a need for doing them. A massive training program was conducted, targeted mainly at supervisors. Management felt that, if they could get a core of managers on board, who understood the need for the program and what it was about, they could create an environment in which it would grow.

At that time there were over 2000 supervisors and managers employed at the facility, and 100 percent of those people were trained in a 16 hour awareness course. The course was designed to tell what TQM was all about and why

it was necessary. That course was followed by another 16 hour course, targeted at all the managers, telling them how to apply TQM to accomplish the requirements of the strategic operating plan (SOP).

Training in statistical process control was provided on an as needed basis. Short courses, designed to help PAT teams or quality action teams get started, were conducted. Some work sampling was done and the results were provided to the teams. Training was designed for performance action team leaders. If a PAT team was needed in a particular area and an individual was selected to lead the team, formal training was provided on tools and group dynamics. A good deal of money was spent on training, benefiting both initiatives.

The respondent stated that a deficiency common to both examples was that training was not pushed low enough. Too much concentration was placed on the managers, recognizing as Deming says, that managers were responsible for 95 percent of the activities, and they set the policies. People were not able to come in and make big changes in a process when they lacked training and management support. This problem was identified during a visit by the evaluation team for the 1991 Presidential Award.

In a training related initiative, management started a quality forum, inviting speakers from unrelated industries, but focusing on universal issues such as: continuous

improvement, people, customer focus, and quality, to speak to senior managers. This program was well received. The speakers made managers realize that they were not facing unique problems. This quality forum also benefited both initiatives.

Measurement was done in the traditional way in both of the initiatives. If a process normally took an hour and a half and it was reduced to an hour, that process was improved by a third. There was a staff of industrial engineers who helped with measuring in the industrial lab, and statistical methods were used to evaluate measurements in both cases. Measurements involving cash savings were usually straight forward; however, measurements involving cost avoidance were sometimes difficult to quantify.

Employee empowerment was reflected in both initiatives. First information was shared with the employees, providing them with: (1) an overview of what the business was about; (2) an understanding of what was going on in the organization; and (3) an understanding of what they needed to do and what their role was. This provided each employee with an information base.

As each employee assimilated this information, and developed an understanding of the operation and what the objectives were, they were empowered to do things and to take more responsibility. At this point, employees had enough knowledge to be confident in themselves and to be

willing to go forward. Empowerment played an important part in both initiatives.

Recognition played a strong positive role in both initiatives. There were a number of recognition methods in place including: (1) a management group that recognized TQM excellence with annual performance awards; (2) a watch with the facility logo that the Commanding Officer presented to individuals who had done particularly noteworthy things; and (3) a facility newspaper that included recognition of TQM accomplishments. Team accomplishments were emphasized, but individual efforts were also recognized. These programs represented the formal recognition processes. Letters, notes and cards from the Commanding Officer or the Quality Department played an unofficial role.

Top management was cited as visionary. Past and present Commanding Officers exhibited a great deal of leadership in trying to create an environment in which the cultural change necessary for continuous improvement could occur. From the beginning support was there from the Commanding Officer for both initiatives. Initially a number of department heads were not supportive; however, most were, and a good deal of headway was made. The goal was Deming's critical mass in the top management ranks where 50-60 percent of managers were on board. Although the respondent was not sure what the percentages eventually were, he was

sure that critical mass was achieved, but that 100 percent support was not.

From a departmental and an organizational standpoint, it was decided that, from the beginning, the quality assurance officer should be a visible part of the quality program. The industrial laboratory fell under the jurisdiction of the quality assurance officer. The PAT team that was so very successful benefited from this positive influence, as did the PAT team in the failed initiative.

Strategic planning was also an important part of the overall effort. There was a strategic operating plan (SOP) for the facility. There was also a document called the Corporate Operations Strategy and Plan that came from headquarters. The Corporate Operations Strategy and Plan accommodated all like facilities and defined the corporate viewpoint from which the facility SOPs were derived. These SOPs were updated every year, providing an evolving picture of the objectives for each facility. Then the smaller divisions, the laboratory for example, took that plan and made their own plans in support of the facility plan. Strategic planning supported both initiatives.

There were no resource constraints that affected the implementation of either initiative. Knowledge was freely available from the Quality Office. Quality's job was to go out and enlighten people, so they perceived a need on their own. The support materials budget was small but adequate.

There were more than 200 books available in the Technical Library, and money was regularly allocated to buy more. Videos were also purchased, but people were encouraged to read. Again, all this educational material supported both initiatives equally.

Case Three

In this case the two initiatives offered as examples were briefed by their respective team leaders. Two separate interviews were conducted at different times on the same day. One interview concerned reducing the number of equipment malfunctions, and the other interview concerned project development standardization. Chronologically, the successful effort originated in January 1988, followed just over three years later by the unsuccessful effort. Both efforts were terminated in the Fall of 1991.

Continuous Improvement Achieved: The Equipment Malfunction Initiative. The successful initiative involved frequent equipment malfunctions, long turnaround times and high material usage rates. The improvement effort, begun in February 1990, was a result of concerns and recommendations voiced by operator and staff level personnel. The activity as a whole was operating under TQM with top management directing the formation of Process Action Teams (PATs) to work in specific areas. However, no top management attention was directed toward this particular area.

Operators and staff personnel went to management asking to form a PAT team to work on improving their process. Everyone involved with the process was part of the team, including top management and a contractor.

The Quality Department provided training on the guidelines for forming a PAT team and on the appropriate methods for tracking process attributes. Many of the operators, contractor equipment technicians, and customers were unaware of problems in the area, but measurement and analysis provided convincing evidence of problems within the process.

Employee empowerment and teamwork were viewed as the main factors contributing to the success of the initiative. Those closest to the process, the employees, were the ones most concerned and eager to achieve improvement. The quality award winning contractor, represented on the team, was especially cooperative in the effort. Contractor contributions resulted in reduced equipment downtime and shorter equipment turnaround times.

Training was another key factor in this initiative. Employees involved with the process received TQM training after they convinced management that problems existed and the PAT team was authorized. None of the employees had previously received formal, in-depth, TQM training.

Recognition was not cited as having either a positive or negative influence on this initiative, but the

recognition bestowed was seen as a potential positive influence on future initiatives. The PAT team received the activity Team of the Quarter and Team of the Year Awards. The team leader was recognized as the Employee of the Quarter and the Employee of the Year for 1991. The team and their achievements were made highly visible and were frequently called upon to brief official visitors.

The respondent was not familiar with any strategic plan for quality used within the activity. A set of fourteen points was mentioned in connection with the role of strategic quality planning in the initiative. Documentation received regarding this example included a fourteen point status checklist entitled Quality Management Strategy.

Measurable improvements were achieved in this effort. Equipment malfunctions per quarter were reduced from 475 to under 100 in the quarter ending June 1992. Equipment downtime was reduced from over eight percent to less than three percent between January 1988 and April 1993. Material usage rates dropped by 3 million per month between February 1991 and April 1993. Although the PAT team was dissolved in September 1991, the activity continued to monitor the process, seeking further improvements.

Continuous Improvement Not Achieved: The Project Development Initiative. The unsuccessful initiative involved an attempt to develop a standard methodology for project development and to provide a framework for

management review and control. Project resource requirements and completion time estimates were arrived at using different methods; consequently, these estimates were often inaccurate and led to customer dissatisfaction. Top management noticed that project development activities were not being carried out in a standardized manner, and directed that a single method be selected and utilized throughout.

The reason cited for the failure of this initiative was that it never attained top management support. This effort was pursued for four months, then the middle manager who had championed the effort was reassigned to another department. A month later the team leader was loaned to another organization and the initiative died. The respondent stated that the initiative was not a priority for anyone, and that the only one that really showed an interest was the middle manager who was subsequently reassigned.

The Quality Office was cited as helpful in developing the appropriate metrics. Overall the role of the Quality Department was viewed as a positive influence in the initiative.

Training in TQM was also not perceived to have been an issue in the demise of the initiative. Everyone within the activity had received at least 40 hours of TQM training.

The initiative did not last long enough for recognition or measurement to play significant roles and teamwork was not mentioned by the respondent; however, employee

empowerment was rated above average. The team members were given authority to conduct the improvement initiative as they saw fit. Other activities engaged in project management were surveyed or invited to attend team meetings.

When asked about the activity's strategic quality planning, the respondent mentioned a quality management strategy. Management encouraged personnel engaged in process improvement efforts to follow the fourteen steps laid out in this strategy. The projects status, relative to the 14 steps, was then briefed during management reviews.

The origin of this initiative was informal. It did not result from a recommendation by the activities strategy review board. Rather, top management perceived the need for improvement and directed action be taken.

No attempt was made to keep this initiative alive, possibly due to a change in the type and number of projects attempted. The problem of nonstandard project management and estimating still exists, but on a smaller scale.

Compare and Contrast. The initiatives undertaken in each of the examples were not derived from any overall strategic plan. In both initiatives the Quality Office was involved and had a positive influence. Training was not regarded as a problem in either example.

The key difference between the two examples was the lack of top management support for the project management initiative. Even though top management directed action to

be taken to improve the process, it was not given any
priority.

Analysis of Initiative Summaries

The information from each of the six initiatives was
analyzed, and then tabulated on a case by case basis. The
analysis and the tables are presented in Chapter V.

V. Case Analysis and Conclusions

Introduction

The objective of this research was to determine whether or not DOD activities, operating under the Total Quality Management concept, were continuously improving; and to identify factors affecting their degree of commitment, or lack of commitment, to continuous improvement. Answers to the following questions were considered to be necessary in order to achieve the research objective:

1. To what extent are DOD activities engaged in continuous improvement?

2. What factors are considered most important in influencing the degree of commitment, or lack of commitment, to continuous improvement in DOD activities?

In the initial phase of this research, a review of the available TQM literature was conducted. This review included the foundational writings and philosophies of the fathers of TQM, some of their more recent writings and the works of others active in the field. From this review, a set of key factors, those most commonly mentioned in TQM literature in connection with continuous improvement, was synthesized.

Pattern Matching

The following seven factors formed the pattern expected to be found in activities where continuous improvement was achieved:

- top management leadership and support
- the role of the Quality Assurance Department
- training and recognition
- measurement and analysis
- employee empowerment and teamwork
- strategic quality planning
- quality and productivity improvement results.

Telephone interviews were conducted with designated representatives of three award winning activities. Each activity presented two examples of improvement initiatives, one in which continuous improvement was achieved and one in which continuous improvement was not achieved. The interview dialog was reviewed for evidence of the positive or negative influence of the seven factors. When the influence of a specific factor was not touched on in answers to the initial open-ended questions, specific follow-on questions (see Appendix) were asked.

After a thorough review of interview transcripts, Table 5, Table 6 and Table 7 were constructed to provide a graphic presentation of the factors and their influence on each of the initiatives. A plus sign denoted the presence of a

particular factor, and a negative sign denoted the absence
of that factor. A strong relationship was expected between
the number of factors present and the success of the
initiative. In essence the empirically based pattern of
factors was expected to match the pattern of factors
synthesized from the literature.

TABLE 5

CASE 1 INITIATIVES:
OVERHAUL/STATISTICAL PROCESS CONTROL
FACTORS AFFECTING CONTINUOUS IMPROVEMENT

Factor	Successful Initiative	Unsuccessful Initiative
Top Management Leadership and Support	+	+
Role of the Quality Assurance Department	-	-
Training and Recognition	+	-
Measurement and Analysis	+	-
Employee Empowerment and Teamwork	+	-
Strategic Quality Planning	+	+
Quality and Productivity Improvement Results	+	-

In every case, in the initiatives cited as successfully
achieving continuous improvement, the empirically based
pattern closely matched the predicted pattern. In all of

71

the initiatives where continuous improvement was achieved,

at least six of the seven factors were present. In the

TABLE 6

CASE 2 INITIATIVES:
LAB/PASS OFFICE
FACTORS AFFECTING CONTINUOUS IMPROVEMENT

Factor	Successful Initiative	Unsuccessful Initiative
Top Management Leadership and Support	+	+
Role of the Quality Assurance Department	+	-
Training and Recognition	+	-
Measurement and Analysis	+	-
Employee Empowerment and Teamwork	+	+
Strategic Quality Planning	+	-
Quality and Productivity Improvement Results	+	+

initiatives where continuous improvement was not achieved,

less than four of the seven factors were present. In two of

the three examples not achieving continuous improvement, top

management leadership and support was evident but was not

enough to assure the success of the initiative.

Comparing the influence of the factors on each of the

initiatives provided some insight into the impact of each

factor on the achievement of continuous improvement. It was apparent from Tables 5, 6 and 7 that no single factor was sufficient to assure attainment of continuous improvement. The interrelated nature of various factors often made it impossible to infer that one was more important than another.

TABLE 7

CASE 3 INITIATIVES:
EQUIPMENT MALFUNCTION/PROJECT DEVELOPMENT
FACTORS AFFECTING CONTINUOUS IMPROVEMENT

Factor	Successful Initiative	Unsuccessful Initiative
Top Management Leadership and Support	+	-
Role of the Quality Assurance Department	+	+
Training and Recognition	+	+
Measurement and Analysis	+	-
Employee Empowerment and Teamwork	+	+
Strategic Quality Planning	+	-
Quality and Productivity Improvement Results	+	-

Top Management Leadership and Support

In all but one example, the Case 3 Project Development initiative, top level management leadership and support was present and had a positive effect on the initiatives. However, top management support and leadership alone was not enough to ensure the successful achievement of CI. In the Case 1 Statistical Process Control initiative, the lack of support and leadership from mid-level managers caused the initiative to fail. In the Pass Office initiative in Case 2, the failure of mid-level management to institutionalize improvements, to make them part of the corporate culture, ultimately led to a decline in quality and customer service. The Case 3 Project Development initiative clearly revealed that when top management leadership and support were not there, failure was inevitable. This initiative died, because top management was not behind it.

The Role of the Quality Assurance Department

In two of the three cases the Quality Assurance (QA) Department was characterized as having had a positive influence on the improvement effort. The influence of the QA Department was most often associated with training. The QA Department provided either formal classroom or informal one-on-one TQM training.

In Case 2, the Pass Office initiative, QA had a positive initial impact, but their failure to follow through

to help ensure that the effort was institutionalized resulted in a negative rating for this category. Within one activity, QA personnel could not or would not shift to the new culture of TQM from the old culture of inspecting and policing for procedural compliance. In this activity the QA Department had a negative impact on process improvement efforts and was eventually disbanded.

Training and Recognition

Training in all three activities was of vital importance. In each case employees were at least aware of TQM philosophies prior to embarking on any improvement initiative. Employees received advanced courses of instruction after their processes were specifically targeted for improvement. Respondents in Cases 1 and 2 mentioned the cultural change embodied in the shift to a TQM style of management. The point was made that it was imperative that all employees understood the need for the change in management philosophy and techniques, and that they be aware of the objectives and benefits of TQM. Great emphasis, either directly or indirectly, was placed on the institutionalization of the precepts of TQM.

The Case 1 Statistical Process Control initiative provided an example of the consequences of the failure to impart a universal understanding of TQM. The Pass Office initiative in Case 2 was a prime example of not

incorporating the changes made during the improvement process into a new work standard. The necessity for achieving a universal understanding of TQM was seen in the decline in service in this same example. New personnel did not have the same understanding of TQM, particularly its customer focus aspect, and management did not ensure that customer focus was included as part of their orientation brief and subsequent training sessions.

Some recognition system was present in each of the three activities. While viewed as a positive influence, recognition was not considered a major factor in the achievement of continuous improvement. All three activities stated that their recognition programs focused on team accomplishments more than on individuals. The prevailing view was that individual awards detracted from team efforts. One respondent stated that a productivity gain sharing program had replaced performance awards, and that fifty percent of all monetary savings were passed on to activity employees.

Measurement and Analysis

Measurement and analysis were mentioned in connection with each successful initiative, and both were viewed as critical to the achievement of continuous improvement. In the Overhaul initiative in Case 1, measurement and analysis

were the key to reducing the number of adjustment and test cycles from twenty-five to one.

In the Lab initiative in Case 2, lab personnel conducted an extensive, detailed analysis of their processes and were continuing to monitor and re-evaluate at this writing. The respondent in Case 3, discussing the Equipment Malfunctions initiative, stated that without measurement no one would know if there was a problem with the process except the equipment operator. Tracking the process through the use of metrics was absolutely key to improving the process.

Employee Empowerment and Teamwork

In every case respondents emphasized the necessity to involve everyone in the improvement process. At the operational level, the initiatives in which everyone involved was included in the improvement effort successfully achieved CI. Where this did not occur, as in the Statistical Process Control initiative and the Pass Office initiative, CI was not achieved. On an organizational level, involvement of every employee was seen as vital to sustain the improvement process, to continuously improve.

Strategic Quality Planning

Two of the three activity's representatives were acquainted with their organizations strategic plan and its relation to TQM. One respondent stated that the strategic

77

plan was extremely important early on in the implementation of TQM. In Case 2 a great deal of emphasis was placed on the role of the strategic plan as the foundation for more focused plans at lower levels of the organization. It was not evident that any of the cited initiatives stemmed directly from an activity's strategic plan.

Quality and Productivity Improvement Results

During the initial conversations with respondents, a problem surfaced concerning the definition of continuous improvement. For some, continuous improvement took on a more global or activity wide perspective rather than a process specific perspective. A second point of contention arose over the language used in the initial questions, specifically the use of the words successful or unsuccessful to describe improvement initiatives which did or did not achieve continuous improvement. An initiative that made improvements, but failed to achieve continuous improvement was considered unsuccessful.

In the Pass Office initiative in Case 2, a vast improvement in the process was made. However, because the process improvements were not internalized or institutionalized, the improvements were reversed as the result of personnel turnover. New procedures were not incorporated into instructions and training programs to

ensure continuation after the initial cadre of personnel, those present at the time improvements were made, were gone.

The iterative process of continuously striving to improve was missing. This suggested a lack of middle management leadership and a lack of an ongoing training program. New personnel, lacking TQM training and unaware of the past improvement process, replaced trained personnel. The new personnel did not have the benefit of instructions and procedures which incorporated the improvements and lessons learned through the improvement effort.

All of the information obtained through interviews and supplemental documentation indicated that the DOD activities studied were vigorously pursuing continuous improvement on a large scale. One of the participating activities was recently presented with a second quality award; however, as indicated by the failure of three of the initiatives, not all attempts were successful or led to continuous improvement.

There was no relationship between the order of occurrence of the initiatives and success. In Case 1 the unsuccessful initiative preceded the successful initiative. Learning may have occurred in this case. However, in the other two cases, the successful initiative preceded the unsuccessful one. In these two cases each initiative rose or fell on its own particular set of circumstances.

The research indicated that when two or more of the seven factors necessary for success were missing, the effort would fail. In two of the cases, this failure occurred in spite of top management commitment. Thousands of dollars and hundreds of man-hours were dedicated to TQM training for activity personnel; however, this was not enough for initiatives where, even though management support was present, management failed to ensure the presence of the other factors.

VI. Recommendations and Future Research

Introduction

This research effort involved exploring an area which had not previously been studied. It has only touched the very surface of the subject of continuous improvement within DOD activities. Given the post cold war environment with its emphasis on the peace dividend, continuous improvement of DOD systems of producing goods and services is imperative.

Recommendations for Achieving Continuous Improvement

To have any hope of success, a continuous improvement initiative must have unequivocal top management support. At the same time, top management support alone cannot guarantee a successful initiative. Management must have a plan that integrates the factors necessary for continuous improvement into a workable initiative, and must possess an understanding that continuous improvement is a never ending process involving everyone in the organization.

Top management must communicate the need for change and the objective of the Total Quality program down to every employee in the organization. One valuable tool to facilitate this is the strategic plan. The plan should provide an agenda for the organization and point to specific objectives for improvement. Even more than that, promulgated down to the worker level, it sends the message

81

that quality and improvement are priorities of the organization.

The Quality Department should support top management in communicating to every employee the need for continuous improvement. Employees will be more likely to support quality efforts when they understand the benefits to the organization and to themselves.

Management leadership and support must take the form of an extensive training program. Management must create an environment wherein a universal understanding of the precepts of Total Quality and continuous improvement exists. Everyone must be involved and understand the program, its purpose and their part in each initiative. When these conditions are met, employees should be empowered to use their skills and unique perspectives to improve their processes.

Teamwork should be emphasized over individual effort, with team goals stressed as a means to accomplish company goals. Rewards should be primarily for team efforts which advance organizational goals.

Procedures need to be in place to measure progress toward these organizational goals, to quantify continuous improvement. Measurement is necessary to identify problems, analyze processes and formulate corrective actions. To sustain improvement, these processes must be monitored using measurement tools.

Once improvements have been achieved and changes are made, it is vital that they be institutionalized. Managers and supervisors at all levels must provide sufficient leadership and direction to ensure that improvements are made a part of a new work standard, and that procedures are updated so that new arrivals to the organization will immediately assimilate the new procedures, the improved processes and the new culture.

Future Research

In this research the case study format was used. A limited number of activities were selected for study. In each case one or two respondents were interviewed via telephone. Views expressed were limited to the informed opinions of the individuals involved. Surveys of a larger cross section may be necessary to more positively establish those factors that are necessary for achievement of continuous improvement, and those that are not, or to prove statistically the relative importance of each factor.

Answers obtained from interviews were dependent on the respondents position in the organization. The results of interviews were also dependent, in large part, on the skills possessed by the interviewers. Neither of the authors had interview experience, nor had they received training regarding interview methodology. Any future research, building on this foundation, can only serve to bring into

sharper focus the inferences made and the insights gained in this research effort.

Factors that influence continuous improvement are inextricably linked or interrelated to each other. As an example, the necessity and influence of training cannot be separated from top management leadership and support. A more in-depth study is needed to establish the magnitude of interrelationships present between factors. A related area of concern was the linking of two attributes within one factor, such as training and recognition. In future studies researchers should consider studying each attribute independently.

Afforded the resources, an in-depth, on-site study would better define the environment within which continuous improvement may be achieved. The changing world order and the resulting reductions in the defense budget make an understanding of this environment imperative. If we in the Department of Defense are to do more with less and do it better, we must improve our systems of producing goods and services. Continuous Improvement is critical to improving these systems; to maintaining the global deterrent vital to protecting our national interests; and to keeping the world safe for democracy.

Appendix: Supplemental Interview Questions

General Information

The material presented in Chapter II, Table 3 and Table 4, was used to identify seven areas believed to be critical to a successful continuous improvement effort. To ensure that these critical areas were addressed in the interviews, a series of follow-on questions were prepared for use on an as needed basis. The questions were designed to address both of the examples, the effort where continuous improvement was achieved and the effort where continuous improvement was not achieved.

Questions

1. What was the role of top management leadership and support in each of the initiatives?

2. What was the role of the Quality Assurance Department in each of the initiatives?

3. What role did training and recognition play in each initiative?

4. What was the role of measurement and analysis in each initiative?

5. What role did employee empowerment and teamwork play in each initiative?

6. What was the role of strategic quality planning in each initiative?

7. What specific quality and productivity improvements resulted from each initiative?

8. What role did resource constraints play in the initiative?

When they were required, questions were asked as presented above. This uniform method of presenting the questions was chosen to avoid leading the respondents and to ensure standardization among the interviews.

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Vita

Lieutenant Commander Mark E. Gabriel was born on 11 February 1951 in Tuscola, Illinois. He graduated from Widefield High School in Colorado Springs, Colorado in 1969 enlisting in the U.S. Navy immediately after graduation. Honorably discharged after serving one enlisted tour as an aircraft airframes mechanic, he attended Georgia Southern College receiving a Bachelor of Science Degree in Biology in June 1979. Immediately following graduation he again entered military service earning a commission in the U.S. Navy in July 1979. He has served as squadron Maintenance/Material Control Officer (MMCO) and as I-level Production Control Officer aboard the aircraft carrier USS Midway (CV-41), home ported in Yokosuka, Japan. Returning stateside he served as the MMCO and finally the Maintenance Officer for Air Test and Evaluation Squadron FIVE where he was responsible for maintaining 16 aircraft employed in testing the Navy's latest air to ground weapons systems. He served in this position until being assigned to the Air Force Institute of Technology (AFIT), in June 1992. Following AFIT he will serve as the I-level department head aboard USS Saipan (LHA-2).

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Vita

Mr. Theodore E. Manis was born on 26 November 1946 in Gladwin, Michigan. He graduated from Martin Hughes High School in Buhl, Minnesota in 1965, and enlisted in the Navy two weeks later. Upon discharge in 1969, he attended Hibbing Junior College in Hibbing, Minnesota, graduating in 1971. He worked as a Personnel Staffing Specialist for the Social Security Administration, Payment Center in Kansas City, Missouri until 1973, leaving to return to school at St Cloud State University, St Cloud, Minnesota. He left St Cloud in 1974, prior to graduation, to accept a position as an Air Traffic Controller with the Federal Aviation Administration. He was serving as an approach controller at the Peoria, Illinois facility at the time of the Professional Air Traffic Controller's Organization (PATCO) strike. In 1982 he entered the University of South Florida, graduating in 1985 with a BS in Geology. He then accepted a Cartographer position with the Defense Mapping Agency Aerospace Center in St Louis, Missouri, working in the Data Services and Scientific Data Departments until selected to attend the Air Force Institute of Technology (AFIT) in 1992. Following graduation he will be assigned to the Defense Mapping Agency Systems Center, Reston, Virginia.

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13. ABSTRACT (Maximum 200 words)

This study looked at factors affecting the success or failure of continuous improvement initiatives in Department of Defense (DOD) activities to determine whether these activities were continuously improving and to identify factors effecting their efforts. Initially a list of relevant factors was compiled from the criteria for various quality awards and from factors cited in the literature. This list was synthesized into seven factors mentioned most often as critical to quality management and continuous improvement. Interviews were then conducted with representatives of the three commands included in the study. Each command provided information on a successful initiative and on an unsuccessful initiative. The interviews were reviewed and analyzed for information related to the seven critical factors, and then the relevant information was compiled into tables to facilitate comparison with these factors. The research indicated that continuous improvement efforts involved many complex interrelationships, and required the presence of at least six of the seven factors for success. This research was intended as a foundation for future work.

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